



Malnutrition associated with head and neck cancers

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ABSTRACT

Cancerous patients, under the chemotherapy or radiotherapy, are at high risk of malnutrition due to the associated complications with the treatment procedures such as chewing problems, dysphagia, nausea etc. Considering the patients' history of alcohol consumption, smoking or any other diseases and performing several physical examinations are essential in early identification of high-risk patients for nutritional complications, losing unintentional weight and fat free mass. In this review, we tried to briefly explain the risk of malnutrition in patients with head and neck cancers who are undergoing surgery, chemotherapy and radiotherapy. Oral nutrition, nasogastric tube and percutaneous endoscopic gastrostomy are different methods of nutritional interventions, which have been compared due to their efficacy in maintaining the patients' weight. In this study, we reviewed the results obtained in clinical trials about the efficacy of intense nutritional intervention on limiting the chemoradiotherapy-associated complications in patients with head and neck cancers.

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Introduction

The risk of malnutrition threatens the life of cancerous patients because it leads to the increased rate of different infections, requirements of further intense care, cost and hospitalization, decreased immunity, delayed wound healing, quality of life and physical functions, disruption of the treatments, increased morbidity and mortality of the patients (1,2). Malnutrition is diagnosed by more than 10% decrease in body weight, which is associated with muscles wasting. Nutritional depletion is known as one of the major consequences of the head and neck squamous cell cancers (HNSCC) mostly involves the oral cavity, oropharynx, hypopharynx and larynx. Xerostomia, dysgeusia, dysphagia and chewing problems, mucositis and nausea, unexplained weight loss are common symptoms in patients with head and neck cancers, which lead to malnutrition. Not only the disease itself affects the

digestive function and the nutritional status but also the treatment procedures including surgery, radiotherapy and chemotherapy negatively have the same effects (3). In situations such as constant consumption of alcohol or for heavy smokers, alcohol metabolite and tobacco are the risk factors of head and neck cancers that exacerbate the occurrence of nutrition deficiency. Based on the reported data, malnutrition occurred in almost 3-52% of the patients before the beginning of the chemoradiation therapies, which will be extended to 44-88% of the patients under the treatment procedures (4). This wide range of malnutrition prevalence rate is the consequent of the different sites of the tumor occurrence, the stage of the cancer, the severity of the conducted therapies and several definition of the malnutrition that can be diagnosed (5). Because nutrition deficiency cannot be diagnosed only based on

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one parameter, identifying more than one of the features that are mentioned below can be considered as the symptoms of the malnutrition including intake energy shortage, weight loss, muscle mass and subcutaneous fat loss, fluid accumulation, decreased functional ability (6). Improving the controlling and maintenance of sufficient nutrition for patients with head and neck cancers is a challengeable issue. Preventing the incidence of malnutrition, early detection and treatment of this condition in patients with head and neck cancers is an important concept. In this regard, we tried to briefly review the results obtained from the studies related to the different aspects of malnutrition in patients with head and neck cancers including their nutritional interventions, quality of life, morbidity and mortality rates. We searched the PubMed for the relevant randomized controlled trials with the nutritional intervention for improving the nutritional condition of HNSCC patients.

Literature review

Weight loss

According to different articles, significant weight loss is the major cause of further complications in HNSCC patients. The immune deficiency of the patients due to the malnutrition can lead to the unrestricted tumor growth. In cancerous malnourished patients, performing immediate antineoplastic procedures is not possible due to their suppressed immunity. Nutritional treatment and improving losing weight before the operations would reduce the rate of postoperative complication occurrence, mortality and morbidity. It has been concluded that preoperative nutritional support in a 7 to 10-day period before the surgery might result in almost 10% reduction in postoperative complications and improve the quality of life in cancerous patients with malnutrition (7). The preoperative nutritional status and the amount of the decreased weight are very influential in the postoperative outcome. Patients who have lost more than 10% of weight are at higher risk for the incidence of the operative-related complications (8). Thus, the degree of the malnutrition can affect the outcomes of the surgical interventions.

Nutritional evaluation of the patients

The most common assessment strategies for detection of HNSCC patients, who are prone to the malnutrition, are the comprehensive history and physical evaluations such as the unexplained weight loss, decreased appetite, physical and anthropometric examinations. Other considerations include evaluating the condition of the quadriceps femoris and the deltoid muscles, checking for any symptoms of the chelosis, stomatitis and scaling

skin, which shows the inadequate vitamin content, calculating the body mass index of the patient. It is proposed that fat free mass (FFM) is the main body composition that its reduction would lead to malnutrition-associated negative consequence. In this regard, increased body weight and BMI do not reflect the BFF changes, which is the main purpose of nutritional interventions (9).

Albumin, as a serum protein, has an impressive prognostic value of postoperative malnutrition, morbidity, sepsis, some infections and mortality rate. Due to the influential role of the preoperative nutritional therapy in decreasing the postsurgical morbidity and mortality rates, evaluation of the albumin is one of the principal markers in nutritional assessments (10).

Transferrin is an iron-binding blood protein, which is another malnutrition marker. Prealbumin is another strong serum marker of nutritional risks which can predict the postoperative outcomes. Measurement of the hemoglobin, hematocrit and white blood cells is used as other indicators of malnutrition that are evaluated while assessing the nutritional status and identifying the patients with nutritional deficiency (11,12).

Treatment of malnutrition

Different medical interventions have been proposed for treating patients with cancer-related anorexia, cachexia or unexplained weight loss which lead to the maintaining energy homeostasis, increasing weight and appetite such as megestrol, ghrelin, ghrelin receptor (GHS-R) agonists, thalidomide, anamorelin and eicosapentaenoic acid (13-17). Pain is another complication in malnourished cancerous patients, which is difficult to be controlled by using medical interventions. According to the previous literatures, nutritional counseling is beneficial for malnourished cases or patients who are at risk of nutritional deficiency.

Nutritional intervention

It has been concluded that nutritional intervention while performing treatment procedures such as radiotherapy or chemotherapy could lead to lower amount of weight loss, better quality of life (QoL) and shorter recovery duration. The exact efficacy of nutritional support is still under consideration. In Table 1, the detailed information of the clinical trials, which compared the efficacy of nutritional counseling with usual nutrition on the occurrence of nutritional complication after the radiotherapy, has been provided.

Based on the study of Isenring in 2004, early and intensive nutritional support of cancerous patients under the radiotherapy procedures, using nutritional counseling (standard nutrition

protocol) resulted in beneficial outcomes regarding the lower weight loss compared with patients under usual care. It was also proposed that weight maintenance was more important and advantageous than increasing the body weight in patients with head and neck cancers (18). According to the study of Ravasco et al. in 2005, individualized dietary counseling was proposed as the most successful nutritional tool in recovering the patients' nutritional status, energy intake, body weight, FFM and quality of life. They have also suggested the nutritional counseling as the most effective way in diminishing radiotherapy-associated complications in patients with head and neck cancers (19). According to their results, nutritional complications occurred in 20% of the group1 with nutritional counseling, 76% of group2 that had supplementary diet and 96% of the control cases. Based on all the randomized control trials included in this review, rate of body weight loss and the occurrence of malnutrition decreased during or after the radiotherapy treatment in patients un-

der the individualized dietary counseling versus patients without or on standard nutritional suggestions. Despite all the mentioned results of the studied trials, the effect of the nutritional counseling on the postradiotherapy complications and mortality rate is still under controversy.

Nutritional administration tools

Oral nutrition administration, using nasogastric tube (NG) and percutaneous endoscopic gastrostomy (PEG) are different nutritional intervention tools mentioned in different studies. The effect of applying NG tube vs. oral nutrition intake has been estimated in some studies and it has resulted that using NG tubes may lead to more beneficial effects regarding the body weight, protein and energy intake. But no statistically significant improvement has been obtained regarding the survival rate of the patients who used the NG tube. It was also proposed that using NG tube could negatively affect the incidence and intensity of the dysphagia, xerostomia, muco-

Table-1. The efficacy of nutritional intervention on patients' nutritional status

Author Year Reference	Patients	Results
Isenring 2004 (18)	Patients: (51 male, 9 female) Age: 61.9±14.0 Under radiotherapy patients Randomized to receive NI (29) or UC(31)	The *NI gr vs. **UC gr: Lower weight loss ($P<0.001$) Better nutritional status:($P=0.020$) Better Global ***Qol: ($P=0.009$) Higher ****FFM which was not statistically significant (0.195)
Isenring 2007 (20)	Patients: (51 male, 9 female) Age: 61.9±14.0 Under radiotherapy NI gr using *****ADA MNT	The NI gr vs. UC gr: Higher mean total kilocalorie ($P=0.029$) Protein intake ($P<0.001$) Difference in fiber intake between the groups were not significant ($P=0.083$)
Ravasco 2005 (19)	Patients:(60 male, 15female Age: 60 ± 11 years -*****Gr 1 (n = 25), dietary counseling with regular foods -gr 2 (n = 25), usual diet plus supplements -gr 3 (n = 25), Control patients 3 months follow-up	At nutritional intervention duration: Gr 1 & 2:Increase energy intake (p V .05) Gr1 &2:Increased protein intake(p V .006) Gr3: Decreased energy & protein intake (p < .01) At 3 month follow up: Gr1 maintained in energy intake Gr2 &3 :baseline or under baseline level of energy intake
Van den Berg 2010 (21)	Patient:(38) oral cavity, oropharyngeal or hypopharyngeal cancers under the radio- therapy treatment Gr1: individual dietary counseling Gr2:Standard care 2 month follow-up	Gr1 vs. Gr2: Reduced weight loss ($P=0.03$) Gr2 vs. Gr1: Increased malnutrition($P=0.02$)

*NI: nutritional intervention; **UC: usual care; ***Qol: quality of life; ****FFM: foot-to-foot bioelectrical impedance

*****ADAMNT: American Dietetic Association Medical Nutrition Therapy (ADA MNT) protocol; *****Gr: group

stitis, nausea, vomiting, constipation and diarrhea (22). Only short duration efficacies have been observed by using PEG compared with NG based on the patients nutritional status and body weight.

In conclusion, there is a strong evidence regarding the efficacy of nutritional intervention of recovering nutritional status of patients with head and neck cancers under the radiotherapy. Early identification of the patients at high risk of malnutrition, assessing their nutritional status and performing the most suitable nutritional interventions are the processes that should be noticed before beginning the treatment procedures. Further studies are needed to confirm the exact effect of nutritional counseling on different radiotherapy-associated complications rather than nutritional status.

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Conflict of Interest

The authors declare no conflict of interest.

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